National Aeronautics and Space Administration

Space Launch System
Highlights

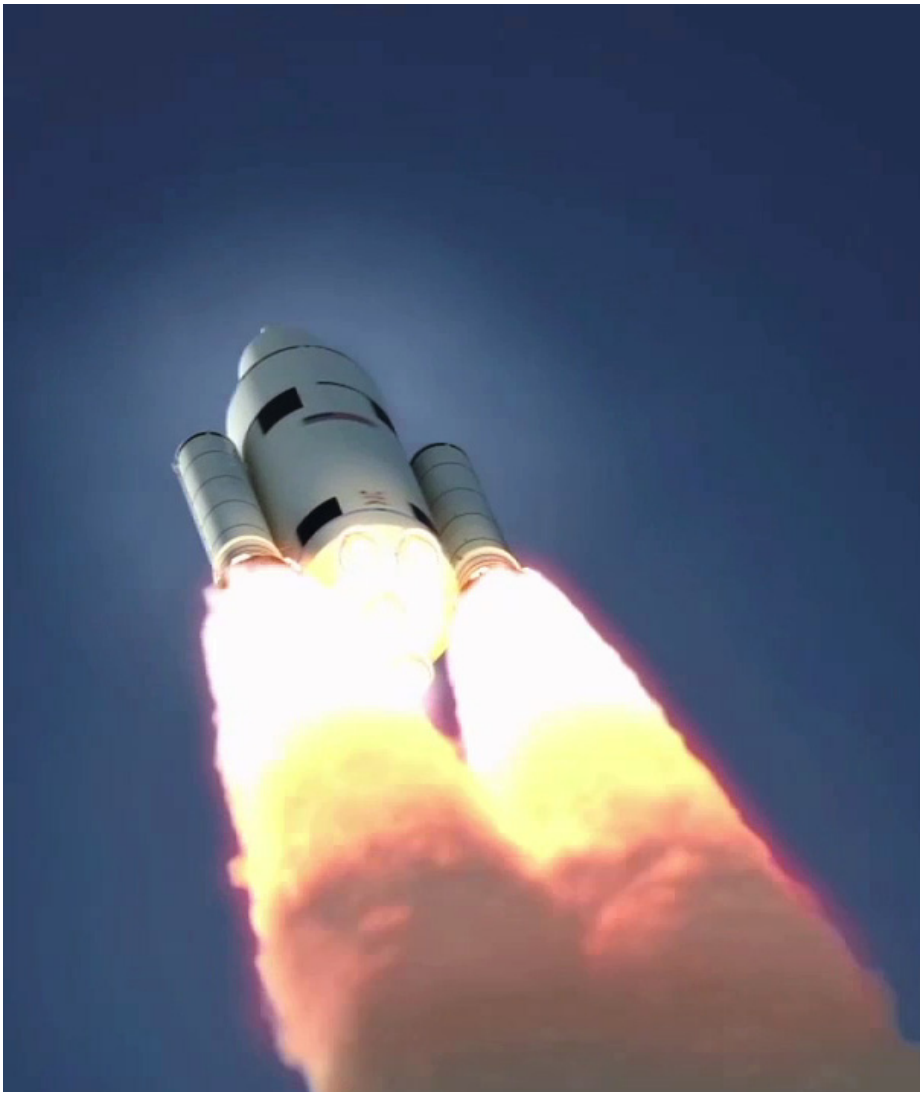
September 2012

SLS: Year 1

On Sept. 14, 2011, NASA announced a new capability for America's space program: a heavy-lift rocket capable of sending spacecraft, including the agency's Orion multi-purpose crew vehicle, deep into space on missions of discovery and exploration.

A year later, the Space Launch System (SLS) Program has made swift progress to use existing hardware, test and develop new components, and pave the way for the launch vehicle that will open new possibilities for scientific study and make human exploration of the solar system a reality.

"The SLS is a national capability and will be the largest rocket ever built, providing the power we need to truly explore beyond our current limits," said Todd May, SLS program manager. "Not only will it take us beyond low Earth orbit, but it will take us there faster, with a larger payload and can combine multiple science missions into a single launch, helping ease budget considerations."



NASA released the video "Space Launch System: Powering Forward" to commemorate the first year of progress for the new SLS rocket. *Credit: NASA/MSFC*

This SLM machine is an M2 Cusing™ manufactured by the German company Concept Laser®. *Credit: NASA/MSFC*

Selective Laser Melting at Marshall

A selective laser melting (SLM) machine from the SLS Engines Office will make rocket engine fabrication more efficient and affordable. It will be used to develop a material properties database for various alloys and, ultimately, hardware for the RS-25 and J-2X engines.

“This machine will allow our engineers to have greater insight into the SLM process, reducing the cycle time for developing and building parts and reducing per-part costs, thus increasing affordability,” said Sheryl Kittredge, Engines deputy manager.

SLM produces nearly-finished parts by using a high-energy fiber laser to melt powdered metal alloys into a cross-section of the part, then slowly building it up in 20-micron layers. Completed parts can be produced with less touch-labor, reduced cost, greater reliability, and in less time than they can be produced today with conventional techniques. This technology has already allowed a maintenance port cover to be produced for the J-2X engine at approximately one-third the previous cost, and the Z-baffle in the pogo suppression assembly is now being evaluated for replacement on the RS-25 engine.

Marshall Innovation and Technology Day

SLS technical experts were on hand during Marshall’s Innovation and Technology Day on Sept. 12, eager to discuss new technologies that will increase efficiency and drive affordability for the new rocket. Notable examples include the SLM process to fabricate parts for engines, as well as common design and manufacturing techniques to develop line replaceable units for boosters. *Credit: NASA/MSFC*

Kennedy and Cape Canaveral Buildings Transition to SLS Boosters

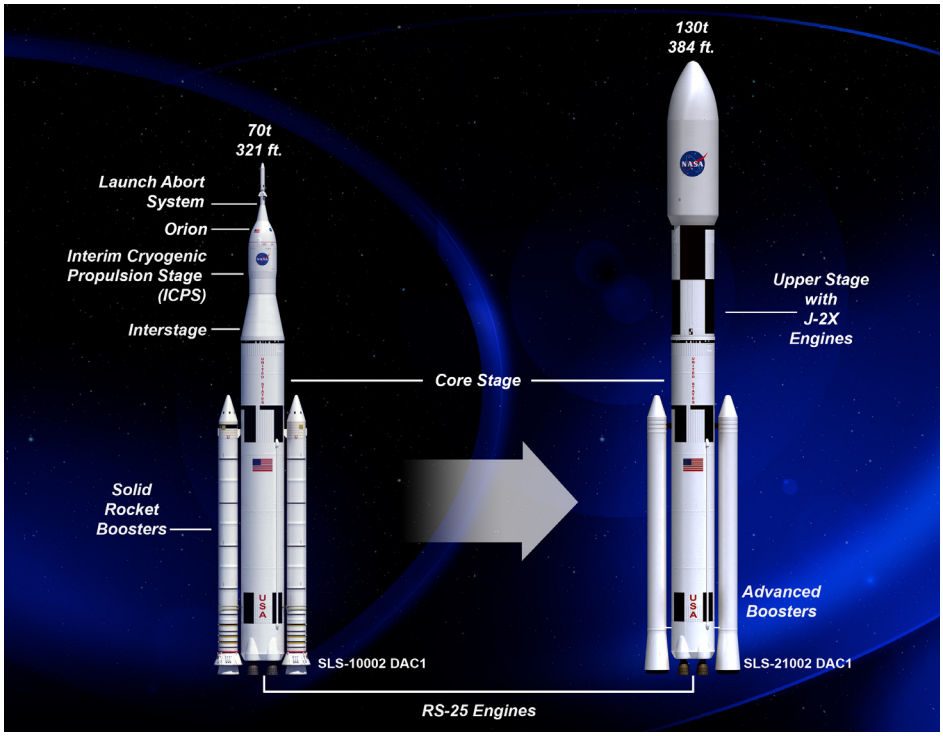
NASA is transferring control of 16 buildings at Kennedy Space Center and Cape Canaveral Air Force Station in Florida to the SLS Boosters Office. All were previously used in support of the Space Shuttle Program. They will now be used to support booster manufacturing activities for the SLS Program.

The most recent buildings to be transitioned are the Paint, Oils, and Lubricants Building and the Aft Skirt Test Facility. Both are located within the Booster Fabrication Facility, formally known as the Assembly and Refurbishment Facility.

Two five-segment solid rocket boosters will be used for the first two flights of the SLS rocket. ATK of Brigham City, Utah – the prime contractor for the boosters – has begun processing its first SLS hardware components, in preparation for initial qualification testing in spring 2013.

In this image, SLS stands on the launch pad in 2017. *Credit: NASA/MSFC*

NASA Selects Proposals for SLS Advanced Development



The initial SLS rocket (left) will have a lift capacity of 70 metric tons (t) while the evolved SLS rocket (right) will have a full lift capacity of 130 t. *Credit: NASA/MSFC*

NASA has selected 26 proposals for contract and grant negotiations from academia and industry responses to a NASA Research Announcement (NRA) seeking innovative and affordable solutions to evolve the SLS rocket from its initial configuration to its full lift capacity.

Proposal selections are the first step in the process. The period of performance for these awards will be one year, with as many as two one-year options. The second step – formal contract awards – will follow further negotiations between NASA and selected organizations. All proposals will be valid for 12 months to allow for a later award if the opportunity becomes available.

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NASA Selects Proposals

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Awards depend on successful negotiation and stability of appropriated funds. Individual awards will vary, with a total government investment of as much as $48 million. Initial fiscal year 2012 awards are worth as much as $2.5 million for academia and $8 million for industry.

Proposals Selected for SLS Advanced Development NRA

Academia proposals:

1. "High Electric Density Device for Aerospace Applications," Auburn University, AL
2. "Challenges Towards Improved Friction Stir Welds Using On-line Sensing of Weld Quality," Louisiana State University, Baton Rouge, LA
3. "A New Modeling Approach for Rotating Cavitation Instabilities in Rocket Engine Turbopumps," Massachusetts Institute of Technology, Cambridge, MA
4. "Algorithmic Enhancements for High-Resolution Hybrid RANS-LES Using Loci-CHEM," Mississippi State University, MS
5. "Next Generation Simulation Infrastructure on Large Scale Multicore Architecture," Mississippi State University, MS
6. "Characterization of Aluminum/Alumina/Carbon Interactions under Simulated Rocket Motor Conditions," Pennsylvania State University, University Park, PA
7. "Development of Subcritical Atomization Models in the Loci Framework for Liquid Rocket Injectors," University of Florida, Gainesville, FL
8. "Determination of Heat Transfer Coefficients for Two-Phase Flows of Cryogenic Propellants During Line Chilldown and Fluid Transport," University of Florida, Gainesville, FL
9. "Validation of Subsonic Film Cooling Numerical Simulations Using Detailed Measurements and Novel Diagnostics," University of Maryland, College Park, MD
10. "Validation of Supersonic Film Cooling Numerical Simulations Using Detailed Measurements and Novel Diagnostics," University of Maryland, College Park, MD
11. "Advanced LES and Laser Diagnostics to Model Transient Combustion-Dynamical Processes in Rocket Engines: Prediction of Flame Stabilization and Combustion-Instabilities," University of Michigan, Ann Arbor, MI
12. "Acoustic Emission-Based Health Monitoring of Space Launch System Structures," University of Utah, Salt Lake City, UT

Industry proposals selected:

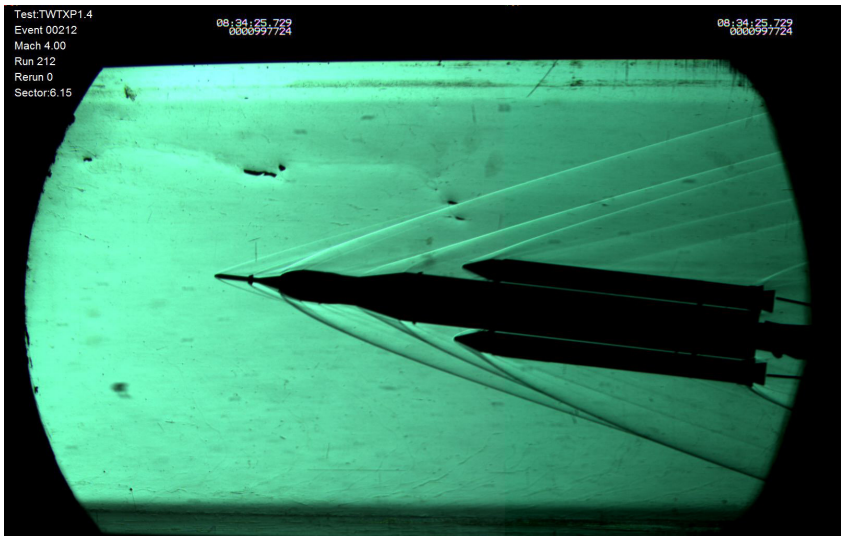
1. "Development of a Fluid-Structure Interaction Methodology for Predicting Engine Loads," ATA Engineering, Inc., San Diego, CA
2. "Space Launch System (SLS) Advanced Development Affordable Composite Structures," ATK Space Systems, Inc., Clearfield, UT
3. "Ball Reliable Advanced Integrated Network," Ball Aerospace & Technologies Corp., Huntsville, AL
4. "Affordable Structural Weight Reduction for SLS Block 1A," Collier Research and Development Corp., Newport News, VA
5. "DESLA Systems Engineering and Risk Reduction for AUSEP," Exquadrum, Inc., Adelanto, CA
6. "Space Launch System Program AUSEP LOX Flow Control Valve," MOOG, Inc. Space and Defense Group, Aurora, NY
7. "Affordable Upper Stage Engine Advanced Development," Northrop Grumman Systems Corp., Redondo Beach, CA
8. "Hybrid Precision Casting for Regeneratively-Cooled Thrust Chamber Components," Orbital Technologies Corp., Madison, WI
9. "NASA Space Launch System (SLS) Advanced Development, Affordable Upper Stage Engine Program (AUSE) Study," Pratt & Whitney Rocketdyne, Inc., Jupiter, FL
10. "Advanced Ordnance Systems Demonstration," Reynolds Systems, Inc., Middletown, CA
11. "Cryo-Tracker Mass Gauging System," Sierra Lobo, Inc., Freemont, OH
12. "Efficient High-Fidelity Design and Analysis Tool for Unsteady Flow Physics in Space Propulsion Geometries," Streamline Numerics, Inc., Gainesville, FL
13. "Robust Distributed Sensor Interface Modules (DSIM) for SLS," The Boeing Company, Huntington Beach, CA
14. "Integrated Vehicle Fluids (IVF)," United Launch Alliance, Centennial, CO

Wind Tunnel Testing Continues at Marshall and Langley

Wind tunnel testing continues to enhance development of the new SLS rocket, America's heavy-lift launch vehicle that will propel NASA's Orion spacecraft, cargo, and scientific payloads into deep space to expand human presence beyond low Earth orbit.

Over the past four months, engineers at Marshall's Tri-Sonic Wind Tunnel have put early SLS scale models through more than 900 tests of various crew and cargo configurations. These tests will provide a basis to assess flight stability for the initial vehicle configuration. "We need to evaluate all the possible conditions that the launch vehicle may encounter as it traverses the atmosphere," said John Blevins, SLS lead engineer for aerodynamics and acoustics. "We look at many different configurations and designs of the same rocket, discovering how it reacts under variations in flight conditions."

As the design matures, the SLS Program will seek greater understanding of the rocket's aerodynamics by testing on a larger geometric scale at Langley's Unitary Plan Wind Tunnel in Hampton, Va., as well as at Boeing's Polysonic Wind Tunnel in St. Louis, Mo. The first large-scale integrated model – a 12-foot-long version – will be tested at Langley's Transonic Dynamics Tunnel.



A model of the 70-ton SLS rocket is tested in Marshall's Tri-Sonic Wind Tunnel. Special cameras and a deflection of light directed through windows in the tunnel are used to show the airflow changing angles at high speeds. *Credit: NASA/MSFC*

"Once we analyze the data, we can determine the best configuration and refine our design of the vehicle," explained SLS Chief Engineer Garry Lyles. "Any changes can be made safely, easily, and inexpensively before the full-scale version is built. This helps ensure that SLS offers a safe, affordable, and sustainable capability for human space exploration."

SLS Chief Engineer Garry Lyles inspects the booster section of a rigid buffet aerodynamic wind tunnel model at Langley. *Credit: NASA/MSFC*

Hispanic Heritage Day

David McBride, director of Dryden Flight Research Center, received an overview of the SLS Program from Jerry Cook, associate program manager, and Sharon Cobb, assistant program manager. Mr. McBride was at Marshall for the Hispanic Heritage Month celebration to speak about NASA's strong diversity ethos and his own Hispanic heritage. *Credit: NASA/MSFC*

Space 2012 Conference

SLS Deputy Program Manager Jody Singer (on right) participated in *Beyond Earth Orbit Human Space Exploration: A Progress Report*, a plenary panel held during the Space 2012 conference. At left is Orion Program Deputy Manager Paul Marshall. Space 2012 was sponsored by the American Institute of Aeronautics and Astronautics (AIAA) from Sept. 11 – 13 in Pasadena, Calif. *Credit: NASA/MSFC*

Spacecraft and Payload Integration Office Manager David Beaman, SLS Engines Office Chief Engineer Katherine Van Hooser, and SLS Engines Office Deputy Manager Sheri Kittredge joined AIAA moderator Don Sauvageau on *Space Launch System Update*, a panel held at Space 2012. SLS prime contractors distributed Program information at the conference, which was attended by 700 people. *Credit: NASA/MSFC*

Space Transportation Association Luncheon

Todd May, SLS Program Manager, presented an SLS update at a luncheon held by the Space Transportation Association on Sept. 21 in Washington, D.C. *Credit: NASA/MSFC*

2012 Moontown Grass Field Fly-In

SLS Education and Public Outreach team members staffed an exhibit visited by over 600 people on Sept. 15 – 16 during the Moontown Grass Field Fly-In, which was held at a small airport near Brownsboro, Ala. *Credit: NASA/MSFC*

For more SLS news, updates and resources, visit www.nasa.gov/sls

Follow SLS on:

Children enjoy hands-on educational activities. *Credit: NASA/MSFC*